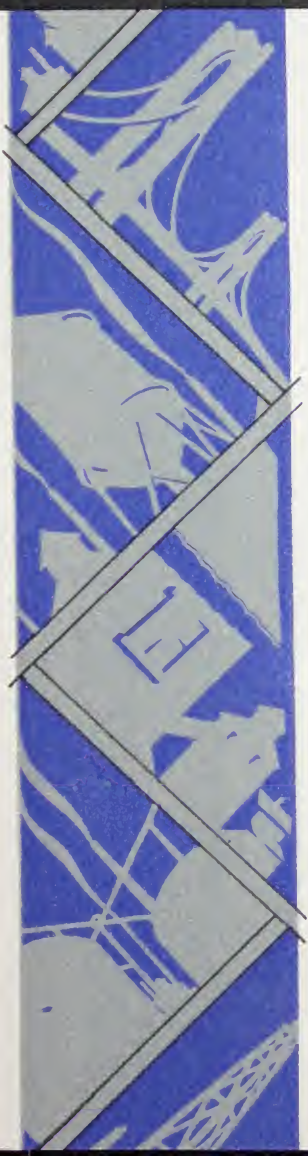
METALLIC ZINC POWDER IN INDUSTRIAL PAINT



THE NEW JERSEY ZINC COMPANY

METALLIC
ZINC POWDER
IN INDUSTRIAL PAINT

THE NEW JERSEY ZINC COMPANY
160 Front Street · New York City

FIGURE 1. Zinc Dust-Zinc Oxide Paint on Corrugated Sheet Zinc and Structural Steel

METALLIC ZINC POWDER IN INDUSTRIAL PAINT

IN ITS constant search for economies and its battle against rust, industry has made many tests with rust-preventive coatings. With each new development in industrial building, metal primers become economically more and more important.

Certain advantages over other types of paints, formulated for industrial finishes are shown by paints containing Metallic Zinc Powder (or so called Zinc Dust), especially in combination with Zinc Oxide. (*Metallic Zinc Powder is a gray pigment distilled in furnaces especially designed and operated for its production.*) These advantages are encouraging the adoption of these paints in the interests of lower plant maintenance costs. For priming and finishing iron and steel (both structural and machine), for galvanized metal and sheet zinc, and for other important, but less common uses, such paints are giving performance of high efficiency.

This performance is due primarily to the following qualities:

1. Rust inhibitive powers of Metallic Zinc Powder;
2. Distensibility of the paint film;
3. Fine adhering qualities (especially on steel and galvanized iron);
4. High hiding power;
5. Ease of application.

The application of many thousands of gallons by brush and spray painting in all parts of the United States and western Europe, as well as the usual panel tests, show results that warrant careful consideration of the use of this paint by all those who are responsible for reducing plant upkeep.

HISTORY

The earliest known references to the use of Zinc Dust in paint date back to 1840, when it was used in western Europe to protect iron. Later authors refer to the great hiding power of paint made on this gray base and its successful use as a rust inhibitor; and recommend its use on machinery, sheet iron, roofs, et cetera. Today, paint of this type has an excellent reputation on the continent, where it is known as "Zinc Gray." In the industrial districts of France, Belgium and western Germany Zinc Dust base paints have long been widely used for preserving metal surfaces in industrial plants.

Apparently the earliest reference to the use of Metallic Zinc Powder in anti-corrosive paint in America was by Henry Williams in 1911, when he described the development of the Norfolk ship-bottom paint, now known as Navy Department Formula 14. In 1913 reports were made on other tests where plates had been exposed outdoors for two years and under water for another year. At the end of these tests the plates painted with Zinc Dust were found in much the best condition. These reports stimulated an interest in the possible use of this rust-inhibitive paint in many different fields in this country, and the result of more intensive investigation indicates that a combination of Zinc Oxide with Zinc Dust yields a paint that offers an unusual degree of protection.

FIGURE 2

Photomicrographs illustrating the plastic properties of a Zinc Dust-Zinc Oxide Paint film after exposure for one year on the south side of a building

"*A*"—Showing typical cut in a plastic material

"*B*"—Paint film molded back into place and cut practically healed. (The remaining marks were practically invisible to the naked eye.)

ZINC DUST PAINT MEETS THE REQUISITES OF A METAL PRIMER

Anyone accustomed to examining paint films that have been weathered will find a great appeal in the way Zinc Dust paints retain their distensible properties, for one of the first requisites of a paint for metals is its ability to expand and contract at different temperatures. This quality is graphically illustrated (Figure 2) by the photomicrographs, (a) and (b) of a Zinc Dust-Zinc Oxide Paint film *after one year's service* on the exposed south side of a wooden structure. The original cut (a) is typical of any cut in a plastic material, where no shattering or tearing of the edges is revealed even under the microscope; (b) further shows how the paint can be pressed back into place and the cut practically healed by molding the plastic paint.

Even after a relatively severe exposure to ultra-violet light, there is less than normal indication of a breakdown of these distensive properties of the film. Also, observation and tests show that changes in the relative humidity of the surrounding atmosphere have a relatively slight effect on these paints as compared with other standard metal priming paints. In spite of the plastic nature of a properly formulated Zinc Dust paint film (such as a Zinc Dust-Zinc Oxide Paint) and its very slight chalking tendencies, it dries to a firm film that holds its color, sheds dirt very well, and does not crack upon exposure.

The advantage of a Zinc Dust paint as a metal primer is increased by the fact that it makes an exceptionally fine base when it is desired to apply ordinary finish coat paints. Tests, however, have shown conclusively that a paint which can be used in two or more coats (both as primer and finish coat) is far superior to any combination of two different paints. And one of the most valuable features of a Zinc Dust paint is the fact that it serves equally well as primer or finish coat.

ZINC DUST PAINTS ARE RUST INHIBITIVE

The Research Division of The New Jersey Zinc Company has made frequent inspections and careful studies of many panels, industrial buildings and steel structures painted with Zinc Dust paints. These observations supplement and clarify the results obtained by many industrial concerns, public utilities, oil refiners, etc., through the use of this paint under various climatic and industrial conditions. The results of these tests have consistently shown the superior rust inhibitive qualities of Zinc Dust Paints, and particularly of paints pigmented with combinations of Zinc Dust and Zinc Oxide.

Three representative panels are shown in Figure 3 after 1½ years' exposure at 45 degree angle facing south. Panel 2 is obviously in a much better condition after this exposure than Panels 1 and 3 which have been painted with two popular types of metal priming paints.

Figure 4 contrasts the effect of two years of exposure on panels painted with Zinc Dust-Zinc Oxide Paint, and a fourth type of paint recently much advocated for coating metal.

Tests were also made on the interiors of open outdoor water tanks which are subject to freezing temperatures in winter and rising and lowering water levels. Figure 5 indicates how much better the Zinc Dust-Zinc Oxide Paint has survived this treatment than the other high-grade metal priming paint

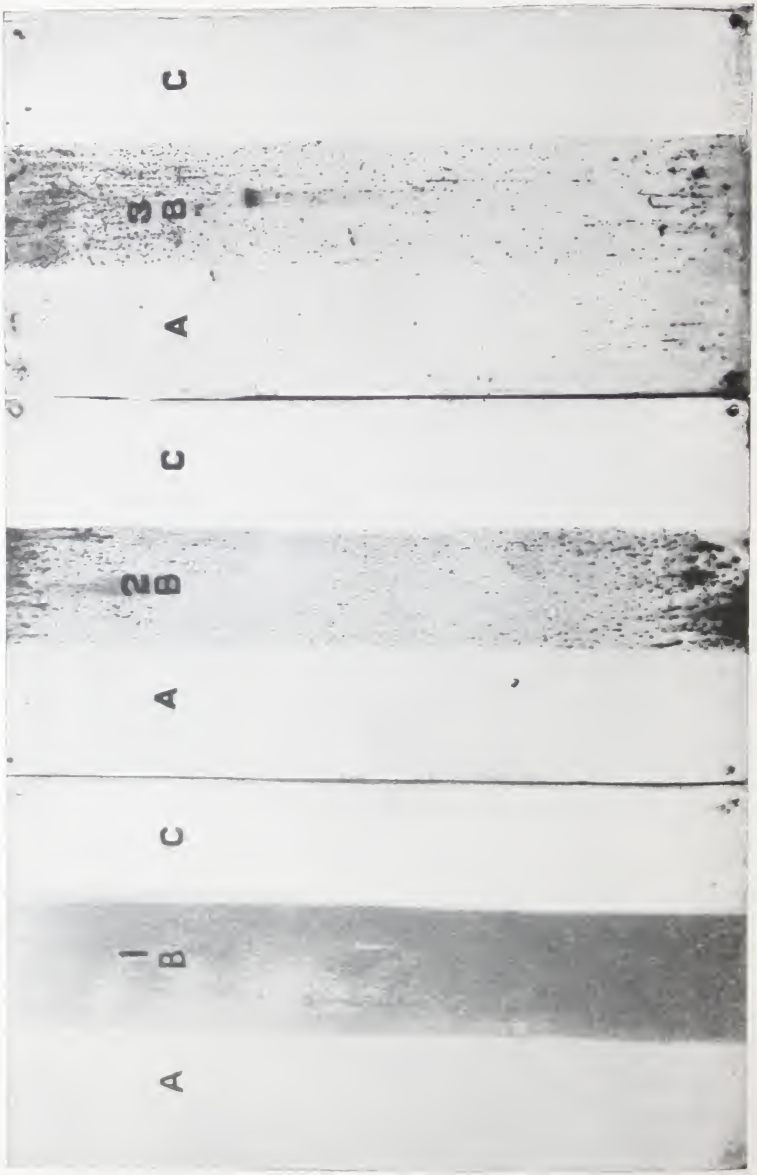


FIGURE 3

FIGURE 3

Three representative panels of a test series after 1½ years' exposure at 45° angle facing south (Bessemer steel panels)

"*A*"—Two coats of the priming paints alone

"*B*"—One coat of the priming paints

"*C*"—One coat of the priming paints plus two coats of a gray industrial finish coat paint

PANEL 1, BLUE LEAD PANEL 2, ZINC DUST-ZINC OXIDE PANEL 3, RED LEAD

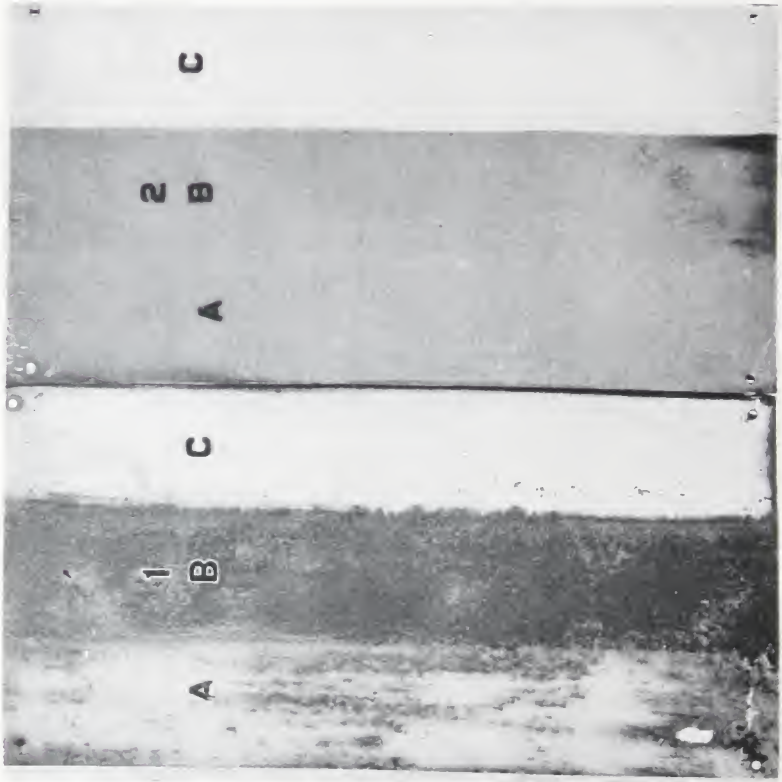


FIGURE 4

FIGURE 4

Three representative panels of a test series after 25 months' exposure, at 45° angle facing south (Bessemer steel panels)

"*A*"—Two coats of the priming paints alone

"*B*"—One coat of the priming paints alone

"*C*"—One coat of the priming paints plus two coats of a gray industrial finish coat paint

PANEL 1, ALUMINUM POWDER PANEL 2, ZINC DUST

A B

FIGURE 5

FIGURE 5

Interior of industrial water tank after $2\frac{1}{2}$ years' service. Photograph taken about 10 feet below water level. Note clean appearance and freedom from blisters on "B."

"A"—Two coats of Iron Oxide-Zinc Oxide Paint that has been successfully used for several years

"B"—Two coats Zinc Dust-Zinc Oxide Paint

FIGURE 6. A transmission tower painted with Zinc Dust-Zinc Oxide Paint

previously used on this type of work. The photograph was made after 2½ years of service. At present the superiority of the Metallic Zinc Powder is even more evident.

Thus, it is well proven by experience that Zinc Dust Paint is rust inhibi-

tive—why, remains to be determined. One theory that has been suggested is that the characteristics of zinc, which are so effective in good galvanizing, are also effective when Metallic Zinc Powder is used in paint as a pigment and applied to iron.

Laboratory support of this theory that Zinc Dust is desirable material to have next to a metal surface may in a measure be found in the following observation. Clean, bright pieces of steel were embedded to a depth of approximately one-eighth inch in each of the following dry pigments:

Graphite	Red Lead
Lead Chromate	Blue Lead
Zinc Dust	Iron Oxide (Fe_2O_3)
Aluminum Powder	Magnetic Iron Oxide (Fe_3O_4)

The glass dishes with their contents were exposed to a saturated atmosphere at a temperature of about 140 degrees Fahr. for one week. A highly ozonized atmosphere also prevailed in the exposure cabinet for one hour each day during the exposure period. When examined after the experiment, the bright shiny surface had disappeared from all except the two specimens embedded in Zinc Dust and Lead Chromate; both of these specimens were untarnished by corrosion. The remaining six samples were all corroded to about the same degree and little difference could be noted between them.

WHY ZINC OXIDE IS ADDED IN ZINC DUST PAINTS

The addition of Zinc Oxide in limited amounts (5 to 25%) to a Zinc Dust paint improves its quality because the finer particle size of the Zinc Oxide supplements the Zinc Dust in making a denser and more impervious film. Zinc Oxide, by forming zinc soaps with the oil, also helps hold the heavier Zinc Dust in suspension, prevents settling and thus eliminates the necessity of much stirring during application.

As is well-known, Zinc Oxide also possesses definite rust inhibitive qualities and, to this extent, it reinforces the rust inhibitive quality of the paint.

USE OF ZINC DUST WITH OTHER PIGMENT COMBINATIONS

Investigations have shown that the rust resisting qualities of other metal protective paints can be improved by adding Zinc Dust, the improvement generally being quite marked whenever the proportion of Zinc Dust

FIGURE 7. An industrial water tank painted inside and out with Zinc Dust-Zinc Oxide Paint

amounts to at least 50% (by weight) of the total pigment. For example, the well-known and recognized metal priming paint combination, consisting of Iron Oxide with Zinc Oxide, produces *very superior* results when modified to contain 50% or more (by weight) of Zinc Dust in combination with the Iron Oxide and Zinc Oxide.

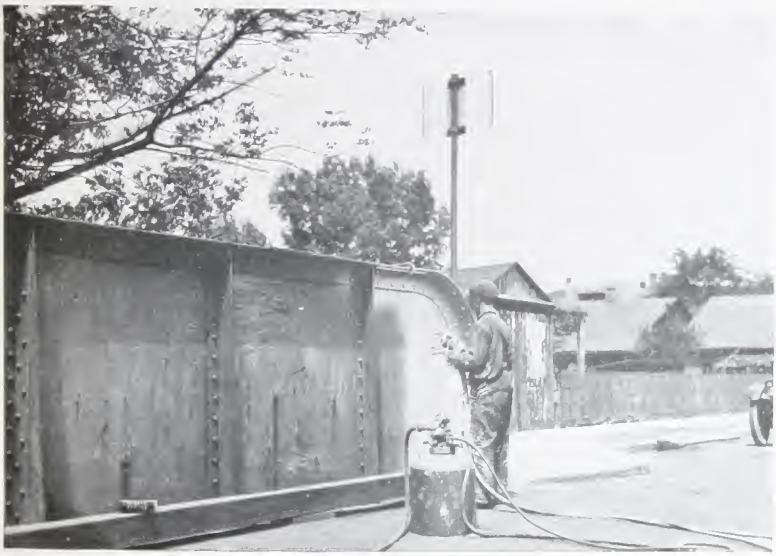


FIGURE 8. Spraying Zinc Dust-Zinc Oxide Paint on a highway bridge

THE HIDING POWER OF ZINC DUST PAINTS

One ordinary coat of a properly thinned Zinc Dust paint can be depended on to obscure entirely a background of any color with an attractive "battleship gray" finish. Zinc Dust, since it consists almost entirely of metallic zinc, is wholly opaque to ordinary light. Even when considerable amounts of other pigments have been added, one ordinary coat is sufficient to cover solidly.

ZINC DUST PAINTS ARE UNEXCELLED FOR PRIMING AND FINISHING GALVANIZED IRON AND SHEET ZINC

The experimental evidence is that the necessity of etching Zinc surfaces by chemical methods is questionable where a paint made up with a combination of Zinc Dust-Zinc Oxide is used, providing the surface is clean (and dry). This does not refer to mechanical roughening of the surface—as light sand-blasting—which in all cases has produced adherence superior to that obtained on untreated or chemically etched surfaces.

Where a waiting period is not objectionable, a ninety day weathering period will dissipate any oil or grease adhering to the sheet zinc or the

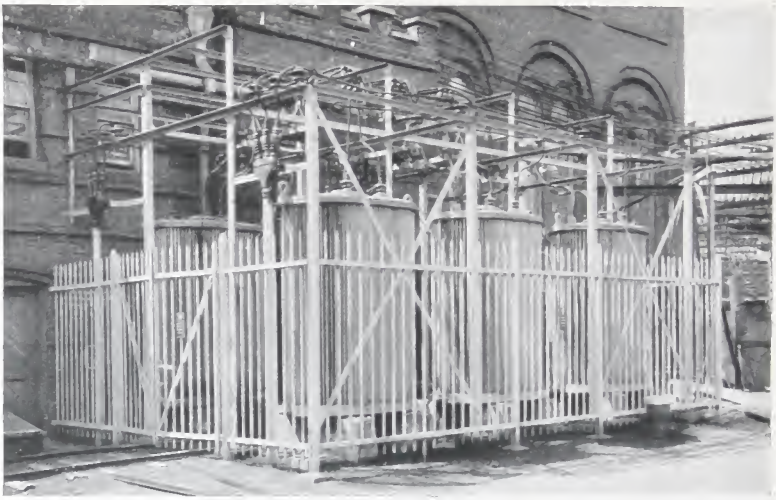


FIGURE 9
Typical industrial job sprayed with Zinc Dust-Zinc Oxide Paint (See Figure No. 10)
(Appearance is similar to that of galvanized metal.)

FIGURE 10
Close-up photograph of transformers in Figure 9 showing the clean appearance of the paint after one year of exposure in a dusty section of an industrial plant

galvanized surfaces, thus removing any possible cause of trouble. This exposure likewise roughens the sheets to some extent, and is a cheaper and quite as satisfactory method of obtaining paint adherence as the average chemical etching treatment.

There is no question but that the prime factor entering into the adhesion of paint to galvanized iron or sheet zinc is the natural sticking qualities a paint has for such surfaces. Performance has shown that Zinc Dust-Zinc Oxide Paint has this property to a much greater degree than other commonly used metal priming paints.

SPRAY APPLICATION

No special manipulations are required in applying properly prepared Zinc Dust paints by the spray method. At the usual pressure for industrial painting (60 to 75 pounds per square inch), such paints may ordinarily be used as prepared for brush application. At lower air pressure, some thinning may be necessary, but no fear need be experienced that the paint may not hide, since the opacity of the paint is very great.

On repaint work, where the old paint is in a fair state of preservation, one coat uniformly applied by spraying is considered adequate, if any previously bare spots have been touched up with priming paint. Figure 8 illustrates the use of a spray gun in the application of Zinc Dust-Zinc Oxide Paint on a highway bridge.

ZINC DUST PAINTS HAVE A WIDE RANGE OF USES

A few general and specific uses for Zinc Dust paints may be mentioned—for example:

Iron and steel surfaces demand a paint that yields a non-porous, distensible film capable of expanding and contracting with the metals, and it must be an efficient rust inhibitor. Properly formulated Zinc Dust paints fulfill these requirements to the greatest degree.

Zinc Dust paints have been found particularly useful on *galvanized metal* and *sheet zinc* where adherence depends on the retention by the oil in the film of its plastic and distensible properties.

The present method of erecting galvanized fence and railings is such that often the zinc coating is cut from the iron. For example, this invariably occurs where *pipe joints* have to be rethreaded. A Zinc Dust-Zinc Oxide linseed oil paste thinned with a small amount of liquid oil drier and possi-

bly a little linseed oil. if the mix is too heavy. placed on the abraded places insures thorough protection against corrosion and avoids the marked color contrasts that naturally result from the use of any other really high-grade, rust-resisting paint.

Zinc Dust-Zinc Oxide imparts a new galvanized appearance to *screens* and protects them from corrosion. This paint adheres tightly to *black iron, galvanized* or *copper screens* and prevents the formation of discolored areas so often observed under screened windows.

Zinc Dust incorporated in a quick drying vehicle yielding a hard abrasive-resistant film admirably adapts itself as a *shop coating material for metal.*

Where it is desired to apply a temporary metal protective coating which may be easily removed. Zinc Dust alone or mixed with other pigments, such as Zinc Oxide. in a non-drying vehicle has found a wide field of usefulness.

Zinc Dust mixed in a special non-drying vehicle has been widely used for *lubricating threads* and preventing leaky connections. This material may be kept indefinitely without becoming hard. thus eliminating the necessity for making a fresh mix for each individual job.

The *interiors of industrial water tanks* is another application on which such a paint has proven exceptionally successful. Figure 5 shows the results of a test which was run on the interior wall of such a tank.

The above will undoubtedly suggest other uses to the man who must always be alert to new ways of cutting down the maintenance costs. The New Jersey Zinc Company has cooperated with many paint manufacturers in investigating the suitability of this type of paint to special jobs. The qualities which make it especially advantageous to many special applications are no longer a matter of conjecture. but are proven facts.